

## EOLP-1396-10-X

1310nm SFP+ single-Mode Transceiver, With Diagnostic Monitoring

10G BASE-LW/LR

0.6~10Gb/s CPRI/OBSAI

Duplex SFP+ Transceiver, RoHS Compliant



### Features

- ◆ Operating Data Rate up to 11.3Gbps
- ◆ 1310nm DFB-LD Transmitter
- ◆ Distance up to 10km
- ◆ Single 3.3V Power Supply and TTL Logic Interface
- ◆ Duplex LC Connector Interface
- ◆ Hot Pluggable
- ◆ Power Dissipation < 1.0W
- ◆ Compliant with MSA SFP+ Specification SFF-8431
- ◆ Compliant with IEEE 802.3ae 10GBASE-LR/LW
- ◆ Operating Case Temperature  
Standard: 0°C~+70°C  
Industrial: -40°C~+85°C
- ◆ Safety Certification: TUV/UL/FDA\*<sup>Note1</sup>
- ◆ RoHS Compliant

### Applications

- ◆ 10GBASE-LR at 10.31 Gbps
- ◆ 10GBASE-LW at 9.95 Gbps
- ◆ OBSAI Rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768 Gb/s
- ◆ CPRI Rates 10.138 Gb/s, 9.830 Gb/s, 7.373 Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614 Gb/s
- ◆ Other Optical Links

### Ordering information

| Part No.       | Data Rate             | Laser      | Fiber Type | Distance | Optical Interface | Temp.      | DDMI |
|----------------|-----------------------|------------|------------|----------|-------------------|------------|------|
| EOLP-1396-10   | 0.614Gbps to 11.3Gbps | 1310nm DFB | SMF        | 10km     | LC                | Standard   | YES  |
| EOLP-1396-10-I | 0.614Gbps to 11.3Gbps | 1310nm DFB | SMF        | 10km     | LC                | Industrial | YES  |

Note 1: For the latest certification information, please check with Eoptolink.

\*The product image only for reference purpose.

## Product Description

The EOLP-1396-10-X series single mode transceiver is small form factor pluggable module for serial optical data communications such as IEEE 802.3ae 10GBASE-LR/LW. It is with the SFP+ 20-pin connector to allow hot plug capability.

This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a 1310nm multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.

The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

## Absolute Maximum Ratings\*<sup>Note2</sup>

| Parameter                           | Symbol          | Min. | Max.            | Unit |
|-------------------------------------|-----------------|------|-----------------|------|
| Storage Temperature                 | T <sub>s</sub>  | -40  | +85             | °C   |
| Supply Voltage                      | V <sub>CC</sub> | -0.5 | 3.6             | V    |
| Input Voltage                       | V <sub>in</sub> | -0.5 | V <sub>CC</sub> | V    |
| Relative Humidity* <sup>Note3</sup> | RH              | 0    | 85              | %    |

Note 2: Exceeding any one of these values may destroy the device permanently.

Note 3: Non-condensing.

## Recommended Operating Conditions

| Parameter                  | Symbol             | Min.           | Typ. | Max. | Unit |    |
|----------------------------|--------------------|----------------|------|------|------|----|
| Operating Case Temperature | T <sub>c</sub>     | EOLP-1396-10   | 0    |      | +70  | °C |
|                            |                    | EOLP-1396-10-I | -40  |      | +85  |    |
| Power Supply Voltage       | V <sub>CC</sub>    | 3.15           | 3.3  | 3.45 | V    |    |
| Power Supply Current       | I <sub>CC</sub>    |                |      | 300  | mA   |    |
| Surge Current              | I <sub>Surge</sub> |                |      | +30  | mA   |    |
| Baud Rate                  |                    | 0.6            |      | 11.3 | Gbps |    |

## Performance Specifications – Electrical

| Parameter                              | Symbol            | Min. | Typ. | Max. | Unit | Notes                            |
|--|-------------------|------|------|------|------|----------------------------------|
| <b>Transmitter</b>                     |                   |      |      |      |      |                                  |
| CML Inputs (Differential)              | V <sub>in</sub>   | 150  |      | 1200 | mVpp | AC coupled inputs                |
| Input AC Common Mode Voltage           |                   | 0    |      | 25   | mV   | RMS                              |
| Input Impedance (Differential)         | Z <sub>in</sub>   | 85   | 100  | 115  | ohm  | R <sub>in</sub> > 100 kohms @ DC |
| Differential Input S-parameter         | S <sub>DD11</sub> | -    | -    | -10  | dB   |                                  |
| Differential to Common Mode Conversion | S <sub>CD11</sub> | -    | -    | -10  | dB   |                                  |

|                                 |                  |     |     |                      |                  |   |
|---------------------------------|------------------|-----|-----|----------------------|------------------|---|
| Tx_DISABLE Input Voltage – High |                  | 2   |     | 3.45                 | V                |   |
| Tx_DISABLE Input Voltage – Low  |                  | 0   |     | 0.8                  | V                |   |
| Tx_FAULT Output Voltage – High  |                  | 2   |     | V <sub>cc</sub> +0.3 | V                | I <sub>o</sub> = 400μA;<br>Host V <sub>cc</sub> |
| Tx_FAULT Output Voltage – Low   |                  | 0   |     | 0.5                  | V                | I <sub>o</sub> = -4.0mA                         |
| <b>Receiver</b>                 |                  |     |     |                      |                  |   |
| CML Outputs (Differential)      | V <sub>out</sub> | 350 |     | 700                  | mV <sub>pp</sub> | AC coupled outputs                              |
| Output AC Common Mode Voltage   |                  | 0   |     | 15                   | mV               | RMS   |
| Output Impedance (Differential) | Z <sub>out</sub> | 90  | 100 | 110                  | ohm              |   |
| Differential Output S-parameter | S <sub>o22</sub> | -   | -   | -10                  | dB               |   |
| Rx_LOS Output Voltage – High    |                  | 2   |     | V <sub>cc</sub> +0.3 | V                | I <sub>o</sub> = 400μA;<br>Host V <sub>cc</sub> |
| Rx_LOS Output Voltage – Low     |                  | 0   |     | 0.8                  | V                | I <sub>o</sub> = -4.0mA                         |
| MOD_DEF (0:2)                   | VoH              | 2.5 |     |                      | V                | With Serial ID                                  |
|                                 | VoL              | 0   |     | 0.5                  | V                |   |

### Performance Specifications – Optical

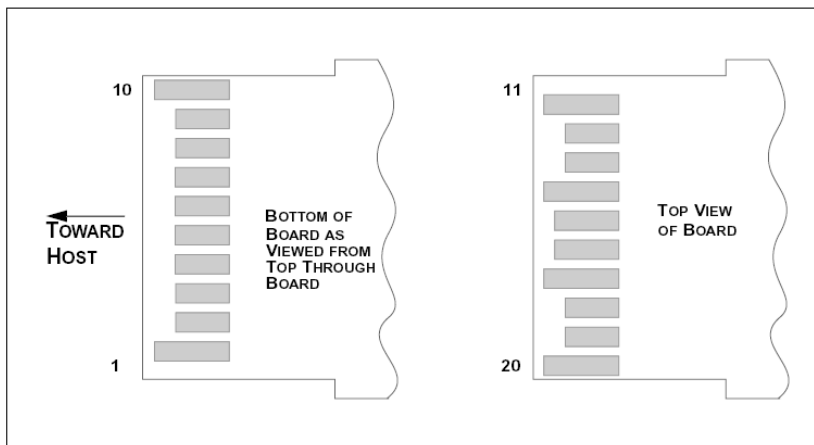
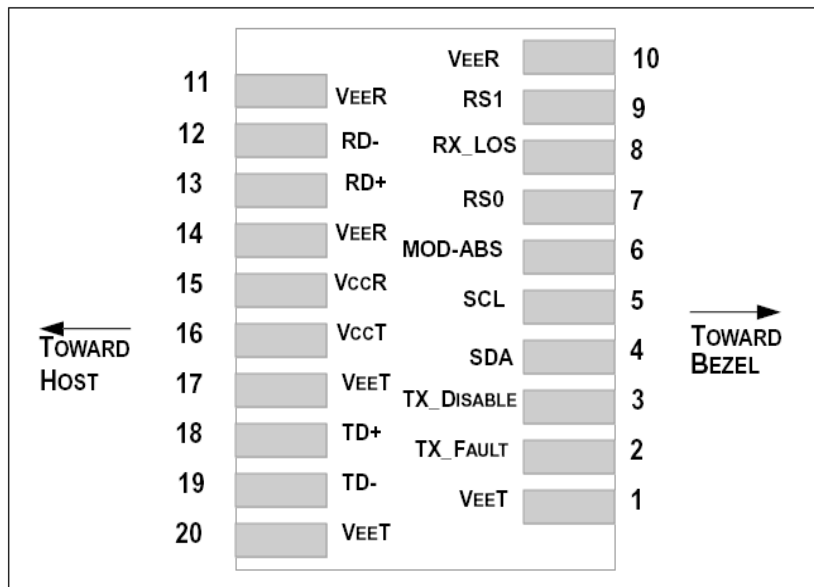
| Parameter                                     | Symbol             | Min. | Typ. | Max. | Unit |
|---|--------------------|------|------|------|------|
| 9μm Core Diameter SMF                         |                    |      | 10   |      | km   |
| Data Rate                                     |                    | 0.6  |      | 11.3 | Gbps |
| <b>Transmitter</b>                            |                    |      |      |      |      |
| Centre Wavelength                             | λ <sub>c</sub>     | 1270 | 1310 | 1355 | nm   |
| Spectral Width (-20dB)                        | Δλ                 |      |      | 1    | nm   |
| Side Mode Suppression Ratio                   | SMSR               | 30   |      |      | dB   |
| Average Output Power* <sup>Note4</sup>        | P <sub>out</sub>   | -8.2 |      | +0.5 | dBm  |
| Extinction Ratio                              | ER                 | 3.5  |      |      | dB   |
| Average Power of OFF Transmitter              | P <sub>off</sub>   |      |      | -30  | dBm  |
| Transmitter Dispersion Penalty                | TDP                |      |      | 3.2  | dB   |
| TX Disable Assert Time                        | t <sub>off</sub>   | -    | -    | 10   | us   |
| TX_DISABLE Negate Time                        | t <sub>on</sub>    | -    | -    | 1    | ms   |
| TX_BISABLE Time to Start Reset                | t <sub>reset</sub> | 10   | -    | -    | us   |
| Time to Initialize, Include Reset of TX_FAULT | t <sub>init</sub>  | -    | -    | 300  | ms   |
| TX_FAULT from Fault to Assertion              | t <sub>fault</sub> | -    | -    | 100  | us   |

| Receiver                                   |                  |      |  |       |     |
|--|------------------|------|--|-------|-----|
| Centre Wavelength                          | $\lambda$        | 1260 |  | 1565  | nm  |
| Receiver Sensitivity (Average) *Note5      | $P_{min}$        |      |  | -14.4 | dBm |
| Receiver Sensitivity (OMA) *Note5          | $P_{min}$        |      |  | -12.6 | dBm |
| Stressed Receiver Sensitivity (OMA) *Note5 | $P_{min}$        |      |  | -10.3 | dBm |
| Receiver Overload                          | $P_{max}$        | 0.5  |  |       | dBm |
| Optical Return Loss                        | ORL              |      |  | -12   | dB  |
| LOS De-Assert                              | LOS <sub>D</sub> |      |  | -16   | dBm |
| LOS Assert                                 | LOS <sub>A</sub> | -28  |  |       | dBm |

Note4: Output is coupled into a 9/125um SMF.

Note5: Minimum optical power measured at the BER less than 1E-12, back to back. The measure pattern is PRBS 2<sup>31</sup>-1.

## SFP+ Transceiver Electrical Pad Layout



## Pin Function Definitions

| Pin Num. | Name       | Function                     | Plug Seq. | Notes                                   |
|----------|------------|------------------------------|-----------|---|
| 1        | VeeT       | Transmitter Ground           | 1         | Note 5                                  |
| 2        | TX Fault   | Transmitter Fault Indication | 3         | Note 1                                  |
| 3        | TX Disable | Transmitter Disable          | 3         | Note 2, Module disables on high or open |
| 4        | SDA        | Module Definition 2          | 3         | 2-wire Serial Interface Data Line.      |
| 5        | SCL        | Module Definition 1          | 3         | 2-wire Serial Interface Clock.          |
| 6        | MOD-ABS    | Module Definition 0          | 3         | Note 3                                  |
| 7        | RS0        | RX Rate Select (LVTTTL).     | 3         | No Function Implement                   |
| 8        | LOS        | Loss of Signal               | 3         | Note 4                                  |
| 9        | RS1        | TX Rate Select (LVTTTL).     | 1         | No Function Implement                   |
| 10       | VeeR       | Receiver Ground              | 1         | Note 5                                  |
| 11       | VeeR       | Receiver Ground              | 1         | Note 5                                  |
| 12       | RD-        | Inv. Received Data Out       | 3         | Note 6                                  |
| 13       | RD+        | Received Data Out            | 3         | Note 7                                  |
| 14       | VeeR       | Receiver Ground              | 1         | Note 5                                  |
| 15       | VccR       | Receiver Power               | 2         | 3.3V ± 5%, Note 7                       |
| 16       | VccT       | Transmitter Power            | 2         | 3.3V ± 5%, Note 7                       |
| 17       | VeeT       | Transmitter Ground           | 1         | Note 5                                  |
| 18       | TD+        | Transmit Data In             | 3         | Note 8                                  |
| 19       | TD-        | Inv. Transmit Data In        | 3         | Note 8                                  |
| 20       | VeeT       | Transmitter Ground           | 1         | Note 5                                  |

### Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT/R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K – 10 KΩ resistor. Its states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 3.465V): Transmitter Disabled

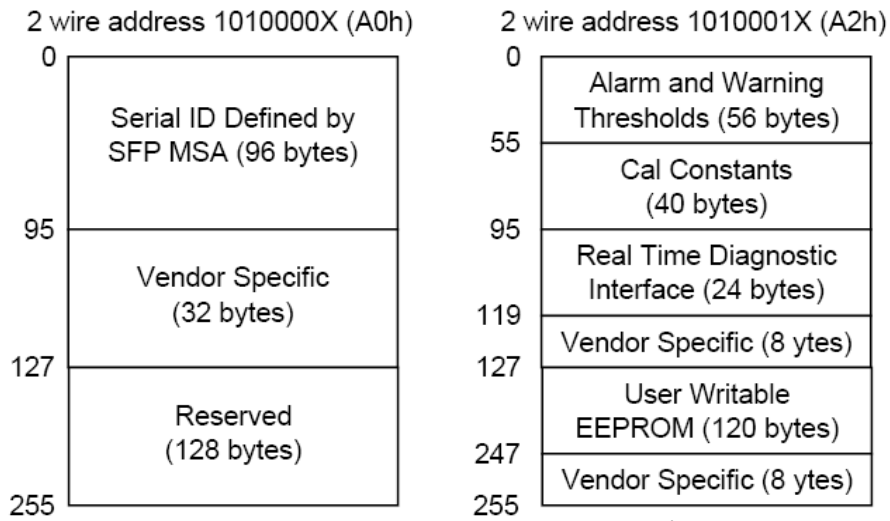
Open: Transmitter Disabled

- 3) Module Absent, connected to VeeT or VeeR in the module.
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and  $V_{ccT/R}+0.3V$ . When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to  $< 0.8V$ .
- 5) The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
- 6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as  $3.3V \pm 5\%$  at the SFP+ connector pin. Maximum supply current is 300mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.
- 8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

## EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not written protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following. For detail EEPROM information, please refer to the related document of SFF 8472 Rev 10.2.



| EEPROM Address        |                   |                 | A0h  | Version     | V1.0 |
|-----------------------|-------------------|-----------------|--|-------------|------|
| Data Addr             | Field Size (Byte) | Name Of filed   | Description of field   | Coded value | Hex  |
| <b>BASE ID FIELDS</b> |                   |                 |  |             |      |
| 0                     | 1                 | Identifier      | Type of serial transceiver                                   | SFP+        | 03   |
| 1                     | 1                 | Ext.Identifier  | Extended identifier of Type of serial transceiver            | MOD_DEF 4   | 04   |
| 2                     | 1                 | Connector       | Code for connector type                                      | LC          | 07   |
| 3                     | 8                 | Transceiver     | 10G Ethernet Compliance Codes & Infiniband Compliance Codes  | 10G Base-LR | 20   |
| 4                     |                   |                 | Part of SONET Compliance Codes                               |             | 00   |
| 5                     |                   |                 | SONET Compliance Codes                                       |             | 00   |
| 6                     |                   |                 | Ethernet Compliance Codes                                    |             | 00   |
| 7                     |                   |                 | Fiber Channel link length & part of Fibre Channel technology |             | 00   |
| 8                     |                   |                 | Part of Fiber Channel transmitter technology                 |             | 00   |
| 9                     |                   |                 | Fiber Channel Transmission media                             |             | 00   |
| 10                    |                   |                 | Fiber Channel speed  |             | 00   |
| 11                    | 1                 | Encoding        | Code for high speed serial encoding algorithm                | 64B/66B     | 06   |
| 12                    | 1                 | BR, Nominal     | Nominal signaling rate, units of 100MBd.                     | 10.3Gbps    | 67   |
| 13                    | 1                 | Rate Identifier | Type of rate select functionality                            |             | 00   |

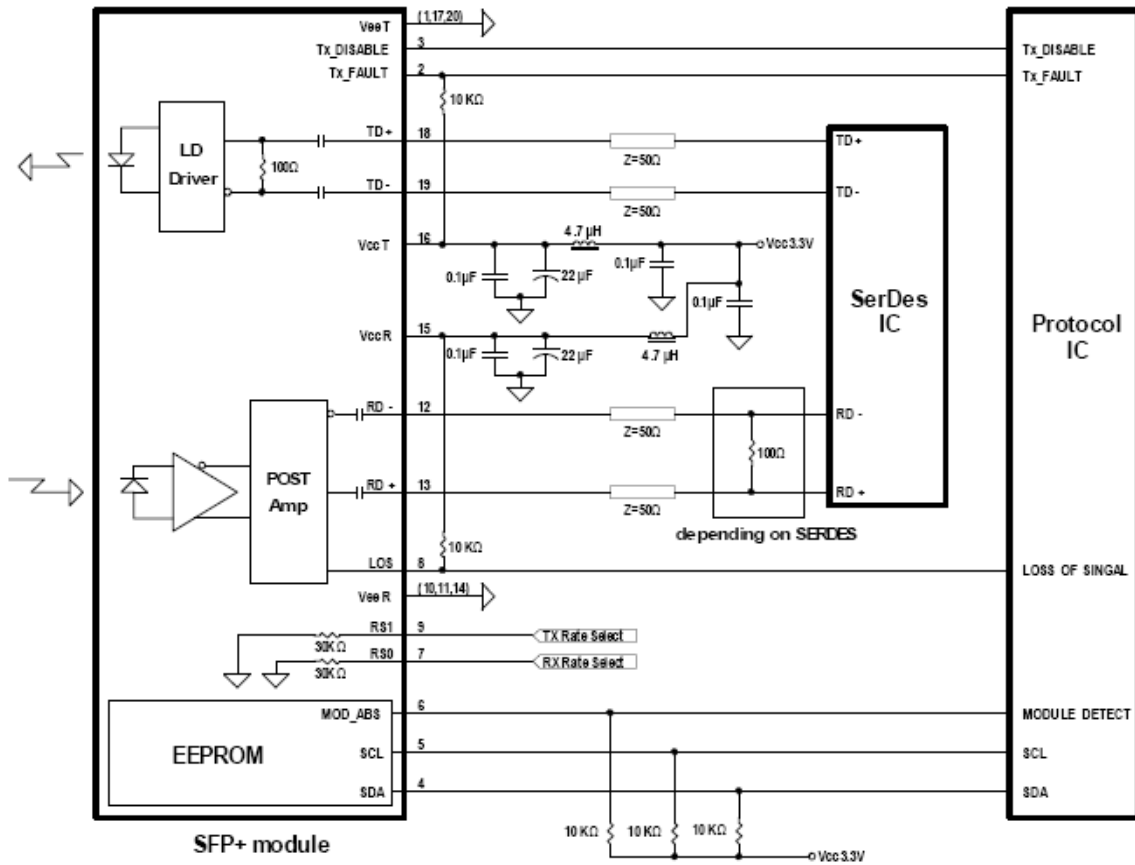
|    |    |                 |   |         |    |
|----|----|-----------------|---|---------|----|
| 14 | 1  | Length(SMF,km)  | Link length supported for single mode fiber, units of km    | 10(km)  | 0A |
| 15 | 1  | Length (SMF)    | Link length supported for single mode fiber, units of 100 m | 10(km)  | 64 |
| 16 | 1  | Length (50um)   | Link length supported for 50 um OM2 fiber, units of 10 m    |         | 00 |
| 17 | 1  | Length (62.5um) | Link length supported for 62.5 um OM1 fiber, units of 10 m  |         | 00 |
| 18 | 1  | Length (Copper) | Link length supported for copper, units of meters           |         | 00 |
| 19 | 1  | Length (OM3)    | Link length supported for 50 um OM3 fiber, units of 10 m    |         | 00 |
| 20 | 16 | Vendor name     | Vendor name (ASCII)   | E       | 45 |
| 21 |    |                 |   | o       | 6F |
| 22 |    |                 |   | p       | 70 |
| 23 |    |                 |   | t       | 74 |
| 24 |    |                 |   | o       | 6F |
| 25 |    |                 |   | l       | 6C |
| 26 |    |                 |   | i       | 69 |
| 27 |    |                 |   | n       | 6E |
| 28 |    |                 |   | k       | 6B |
| 29 |    |                 |   | <space> | 20 |
| 30 |    |                 |   | <space> | 20 |
| 31 |    |                 |   | <space> | 20 |
| 32 |    |                 |   | <space> | 20 |
| 33 |    |                 |   | <space> | 20 |
| 34 |    |                 |   | <space> | 20 |
| 35 |    |                 |   | <space> | 20 |
| 36 | 1  | Reserved        |   |         | 00 |
| 37 | 3  | Vendor OUI      | SFP vendor IEEE company ID                                  |         | 00 |
| 38 |    |                 |   |         | 00 |
| 39 |    |                 |   |         | 00 |
| 40 | 16 | Vendor PN       | Part number provided by vendor (ASCII)                      | E       | 45 |
| 41 |    |                 |   | O       | 4F |
| 42 |    |                 |   | L       | 4C |
| 43 |    |                 |   | P       | 50 |
| 44 |    |                 |   | -       | 2D |
| 45 |    |                 |   | 1       | 31 |
| 46 |    |                 |   | 3       | 33 |
| 47 |    |                 |   | 9       | 39 |
| 48 |    |                 |   | 6       | 36 |
| 49 |    |                 |   | -       | 2D |



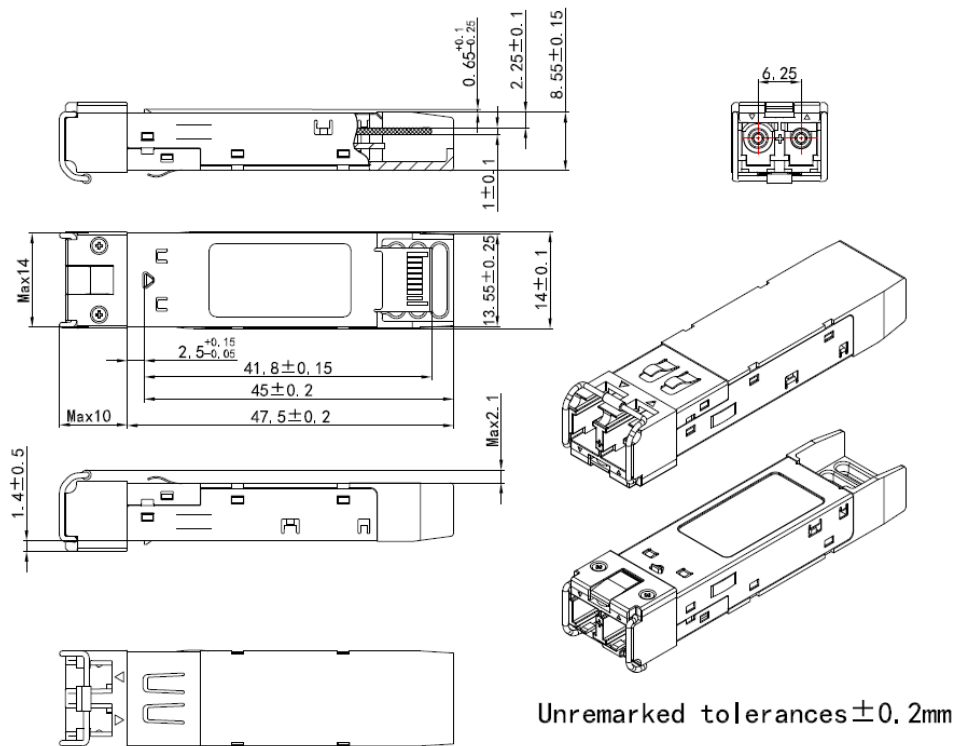
|    |    |            |  |                                    |       |
|----|----|------------|--|------------------------------------|-------|
| 50 |    |            |  | 1                                  | 31    |
| 51 |    |            |  | 0                                  | 30    |
| 52 |    |            |  | -                                  | 2D    |
| 53 |    |            |  | l/<space>                          | 49/20 |
| 54 |    |            |  | <space>                            | 20    |
| 55 |    |            |  | <space>                            | 20    |
| 56 | 4  | Vendor rev | Revision level for part number provided by vendor (ASCII)    | 1                                  | 31    |
| 57 |    |            |  | .                                  | 2E    |
| 58 |    |            |  | 0                                  | 30    |
| 59 |    |            |  | <space>                            | 20    |
| 60 | 2  | Wavelength | Laser Wavelength   | 1310nm                             | 05    |
| 61 |    |            |  |                                    | 1E    |
| 62 | 1  | Reserved   |  |                                    | 00    |
| 63 | 1  | CC_BASE    | Check code for Base ID Fields (addresses 0 to 62)            | Note6                              | xx    |
| 64 | 2  | Options    | Indicates which optional transceiver signals are implemented | TX_DISABLE, TX_FAULT signal,Rx_LOS | 00    |
| 65 |    |            |  |                                    | 1A    |
| 66 | 1  | BR, max    | Upper bit rate margin, units of %                            |                                    | 00    |
| 67 | 1  | BR, min    | Lower bit rate margin, units of %                            |                                    | 00    |
| 68 | 16 | Vendor SN  | Serial number provided by vendor (ASCII)                     | x                                  | xx    |
| 69 |    |            |  | x                                  | xx    |
| 70 |    |            |  | x                                  | xx    |
| 71 |    |            |  | x                                  | xx    |
| 72 |    |            |  | x                                  | xx    |
| 73 |    |            |  | x                                  | xx    |
| 74 |    |            |  | x                                  | xx    |
| 75 |    |            |  | x                                  | xx    |
| 76 |    |            |  | x                                  | xx    |
| 77 |    |            |  | x                                  | xx    |
| 78 |    |            |  | <space>                            | 20    |
| 79 |    |            |  | <space>                            | 20    |
| 80 |    |            |  | <space>                            | 20    |
| 81 |    |            |  | <space>                            | 20    |
| 82 |    |            |  | <space>                            | 20    |
| 83 |    |            |  | <space>                            | 20    |
| 84 | 8  | Date code  | Vendor's manufacturing date code                             | Year                               | xx    |
| 85 |    |            |  | Year                               | xx    |
| 86 |    |            |  | Month                              | xx    |
| 87 |    |            |  | Month                              | xx    |
| 88 |    |            |  | Day                                | xx    |
| 89 |    |            |  | Day                                | xx    |

|   |   |                            |  |  |    |
|---|---|----------------------------|--|--|----|
| 90  |   |                            |  | <Space>  | 20 |
| 91  |   |                            |  | <Space>  | 20 |
| 92  | 1 | Diagnostic Monitoring Type | Type of diagnostic monitoring is implemented               | DD Implemented; Internally Calibrated; Average Power   | 68 |
| 93  | 1 | Enhanced Options           | Optional enhanced features are implemented                 | Optional Alarm/warning Flags Implemented, Optional soft TX_FAULT monitoring, Optional soft RX_LOS monitoring | B0 |
| 94  | 1 | SFF-8472 Compliance        | Revision of SFF-8472 the transceiver complies with         | Rev 10.2 of SFF-8472.  | 03 |
| 95  | 1 | CC_EXT                     | Check code for the Extended ID Fields (addresses 64 to 94) | Note7  |    |
| <p><b>Note 6:</b> The check code shall be the low order 8 bits of the sum of the contents of all the bytes from byte 0 to byte 62, inclusive.</p> |   |                            |  |  |    |
| <p><b>Note7:</b> The check code shall be the low order 8 bits of the sum of the contents of all the bytes from byte 64 to byte 94, inclusive.</p> |   |                            |  |  |    |

### Recommend Circuit Schematic



## Mechanical Specifications



\*This 2D drawing only for reference, please check with Eoptolink before ordering.

## Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

## Obtaining Document

You can visit our website:

<http://www.eoptolink.com>

Or contact Eoptolink Technology Inc., Ltd. Listed at the end of the documentation to get the latest document.

## Revision History

| Revision | Initiated | Reviewed  | Approved | Revision History                           | Release Date |
|----------|-----------|-----------|----------|--|--------------|
| V1.b     | Tim.Liang | Kelly.Cao |          | Released.                                  | 2008-9-17    |
| V1.c     | Phlio     | Kelly     |          | Adding the suitable application.           | 2009-7-17    |
| V1.d     | Cathy     |           |          | Updated output power value.                | 2010-11-3    |
| V1.e     | Cathy     |           |          | Add customized suffix, update temp. range. | 2011-2-22    |

|      |                      |   |  |   |                      |
|------|----------------------|---|--|---|----------------------|
| V1.f | Kelly                |   |  | Update case temp. symbol.   | 2011-6-9             |
| V2.0 | Alex/Townie          | Kelly.Cao   |  | Update spelling mistake   | Aug 10, 2011         |
| V2.a | Townie               | Kelly   |  | Add power dissipation and industrial product.   | Aug 23, 2011         |
| V2.b | Kelly                |   |  | Add TDP.  | Aug 25, 2011         |
| V2.c | Angela, Abby         | Kelly,Fing  |  | Update pin definition notes   | Jan 24, 2013         |
| V2.d | Angela               | Kelly   |  | Add CPRI&OBSAI application  | June 18, 2013        |
| V2.e | Angela               | Kelly   |  | Add notes   | July 1, 2013         |
| V2.f | Fing/Abby            | Kelly/Fing<br>JP.Jiang/<br>Walt                                 |  | Delete Industrial Temperature and update Regulatory Compliance  | Sep 25, 2013         |
| V2.g | Fing/Angela          | Kelly   |  | Add the extended temperature range  | Nov 25,2013          |
| V3.0 | Abby                 | Kelly, Fing   |  | Update Pout   | Jan 4, 2014          |
| V3.a | Angela               | Vina/Fing/Jp/<br>Eason/Jason                                    |  | Add industrial temperature range. Update max data rate, regulatory compliance and the tolerances of 2D drawing. | April 23,2015        |
| V3.b | Torres/Airon<br>Abby | Kelly   |  | Correct a mistake   | Nov 27, 2015         |
| V3.c | Angela               | Kelly/Vina<br>/Dean/<br>Chao.Wang                               |  | Update the CPRI data rates, regulatory compliance and 2D drawing.   | July 17, 2017        |
| V3.d | Angela/<br>Yi.Wan    | Young   |  | Add the EEPORM contents of A0h.   | August 11,<br>2017   |
| V3.e | Angela               | Marvin  |  | Update the optical specifications and contact.  | Feb 05,2018          |
| V3.f | Angela               | Kelly/Elaine/<br>Marvin/<br>Torres/Sky<br>William/Chao<br>.Wang |  | Update the RS0/RS1 Pin function definition notes, picture and 2D drawing.                                       | March 21, 2018       |
| V3.g | Angela               | Kelly   |  | Updated the regulatory compliance.  | August 27,<br>2018   |
| V3.h | Angela               | Kelly/<br>Yiwei.Chen  |  | Updated the regulatory compliance information.  | December 14,<br>2018 |
| V3.i | Nico                 | Marvin/Kelly/<br>Angela/Yi<br>Wan                               |  | Add the parameters of receiver sensitivity (OMA) and stressed receiver sensitivity (OMA).                       | Jul 18, 2019         |

**Notice:**

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